os. The uterus was in the second degree of retroversion. The integrity of the hymen was not regarded, because it was thought that the retro version would require correction. There was no leucorrhœa.

The appearance of the vaginal cervix is well shown in Fig. 3 of the Plate, which was made from life. The macroscopical appearance of the cervix is in all respects similar to that seen after laceration from abortion, miscarriage, or labor; though the case reported was an undoubted case of congenital split of the cervix.

As pointed out by Fischel, the importance of such cases is very great from a medico legal point of view.

A STUDY OF THREE CASES OF TUMOR OF THE BRAIN IN WHICH OPERATION WAS PERFORMED—ONE RECOVERY, TWO DEATHS.

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WITH REMARKS

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AND

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NOTWITHSTANDING the brilliant results obtained in single cases of tumor of the brain operated upon with success, the general results of surgical interference in this class of cases, it must be admitted, are not as encouraging as we would desire them to be, especially when we compare them with the splendid showing of the operative treatment of certain pyogenic diseases of the brain.[1]

From *Chipault's* very complete table in his recent admirable work on the *Surgery of the Nervous System*, I find that 63 of 123 cases of brain-tumor operated upon died from the effects of the operation (51 per cent.). Forty-nine cases in which a tumor was removed recovered from the operation—it is impossible, however, to state exactly how many of these cases were cured of their disease, or even greatly benefited by the operation, which is the salient point of the whole subject.

The difficulties which beset the successful surgical treatment of tumors of the brain are of threefold character:

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[1] See Macewen: Pyogenic Infectious Diseases of the Brain and Spinal Cord, 1893.

1. The difficulties of diagnosis, both of the presence of a new growth and of its exact position in the cranial cavity.
2. The inaccessibility of the new growth.
3. The excessive size of the latter.

Some of these difficulties are insurmountable, notably those offered by the inaccessible location of a tumor, although the limits of "accessibility" vary with the boldness and genius of the surgeon; others again, especially the difficulties of a diagnosis, we neurologists may hope to surmount more and more, as our experience broadens and our knowledge of cerebral anatomy, physiology, and morbid manifestations grows. This purpose, I believe, is served to some extent by a careful study of the clinical history and pathological bearings of every case of brain-tumor we meet with, and especially of every case operated upon, whether with or without success. In this spirit the following study of three cases of brain-tumor I have had operated upon during the last two years is offered for your consideration:

CASE I. *Glio-sarcoma, the size of an almond, developing two years and ten months after the successful removal of a cystic tumor of the left motor area; successful localization and excision; recovery.*—This is the case of cystic tumor of the brain presented to the Neurological Society of New York in January, 1893, and reported in THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES for June, 1893, p. 620. The history of the case as published at the time is briefly recapitulated:

K. H., born in 1866, has been always well prior to her present trouble; no specific nor hereditary taint, no history of injury to the head nor of previous convulsions. In October, 1891, while talking quietly with her husband, the patient suddenly felt the thumb and forefinger of her right hand twitch; the convulsive twitching spread rapidly up the arm to the shoulder and face, leading finally, within a few moments, to a general seizure with loss of consciousness, cyanosis, frothing at the mouth, and general clonic-tonic convulsions. A second similar spell occurred seven weeks later, a third two weeks thereafter, early in December. On December 22d the patient had three seizures, one of them with involuntary micturition. On December 23d she was seen for the first time at the Mt. Sinai Hospital Dispensary. Suspicion of a localized cerebral lesion was immediately aroused; but as she showed absolutely no other symptoms she was put upon bromides and kept under observation. She had spells on January 5th and 13th, three on January 15th, and one on January 19th, after which she had no more general convulsions at all; convulsive twitchings confined to the right hand and forearm, and always beginning in the thumb and index-finger, occurred, however, almost daily.

In February a marked paresis of the right hand developed, which increased slowly in the course of the next few weeks. There never was any headache, vertigo, nausea, drowsiness, or impairment of the memory; there was no tender cranial point. Dr. Koller examined the patient's eyes a number of times and never could discover any sign of beginning papillitis. The deep reflexes were lively on both sides, especially so in the right arm. Localized convulsive twitchings occurred almost daily; one seizure occurred at the dispensary and was witnessed by me.

The diagnosis of an organic lesion, probably a tumor, in the left anterior central convolution at the juncture of the lower and middle thirds, the motor centre for the thumb and forefinger, was made. Although there were but two symptoms present to base a diagnosis upon, they were of great significance; the symptoms of cortical irritation, with subsequent loss of power in the very group of muscles affected by the convulsive twitchings, left no doubt as to the presence of an organic lesion of a progressive and destructive character. The utter failure of thorough treatment with mercury and iodides (300 grains a day) excluded syphilis, nor was there anything to favor the diagnosis of an abscess. In spite of the absence of all general cerebral symptoms the diagnosis of tumor was, therefore, made by exclusion.

The patient was operated upon by Dr. Gerster at the Mt. Sinai Hospital on June 25, 1892. A subcortical cystic tumor was found at the point designated above and evacuated, an ounce of straw-colored serous fluid escaping. Dr. Gerster introduced his little finger into the cyst about one and a half inches and found its walls perfectly smooth. A small layer of gray matter was removed from the exposed centre. The removal of the cyst-wall was considered inadvisable for surgical reasons. The dura was not adherent to the brain at any point.

The patient made a good recovery, gradually regaining the use of her right hand and arm, which were almost entirely paralyzed after the operation. Four weeks later slight convulsive twitchings occurred in the right hand, arm, and face. On August 7th the scalp-wound was reopened, adhesions between the flap of skin and the dura were separated, and a flexible gold plate was inserted between the two to prevent any recurrence of adhesions and to serve as a protection to the brain, the plate projecting slightly beneath the ledges of the opening in the skull.

By the end of October the patient was able to write, sew, and do light housework; before the operation she had not been able to use her hand at all any more, so there can be no doubt that she was benefited by the operation, especially when we bear in mind that the paralysis was steadily progressive at the time.

The most noticeable feature in the case was the *absolute absence* of general cerebral symptoms—this was readily accounted for at the operation by the absence of any increase of the intracranial pressure.

In discussing the pathology of the evacuated cyst the conclusion was arrived at that a *glioma or sarco-glioma was, in all probability, at the bottom of the trouble*; *the fear of a further growth of the neoplasm presumably left in the walls of the cyst was expressed and the desirability of removing the entire cyst-wall emphasized* (p. 624). The subsequent history of this case, which has been under my care ever since, being seen every two to four weeks during this time, is as follows:

December 22, 1892, six months after operation, general epileptic seizure beginning in the right arm. During the next four months twitchings, confined to the right hand or hand and face, occurred at irregular intervals, generally not oftener than every two or three weeks. After each seizure the hand is weak for a few hours. The patient was kept during this time on 2 drachms to 3 drachms of bromide of potash a day. The deep reflexes on the right side of the body are greatly increased; tapping the tibia, for instance, elicits a reflex contraction in the adductors of the thigh.

April 17, 1893, I find noted: For the last four weeks no twitchings have occurred at all; the patient feels very well. Dynamometer-test: R. 30—L. 45.

December 19. The patient has had twitchings every three or four weeks of late. To-day a general seizure occurred, the second one since the operation; the spell began locally like all the previous ones.

January 20, 1894. Third general seizure.

21*st*, 22*d*, 23*d*, and 24*th*. Local seizures, sometimes two or three times a day. No headache, vertigo, nausea, no sign of papillitis (Dr. Koller). Dynamometer-test: R. 30—L. 45.

February 26*th*. Fourth general seizure.

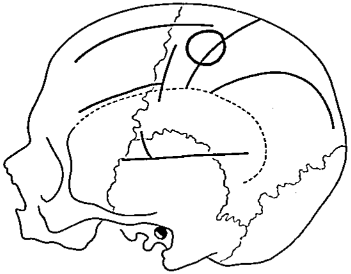
During the next twelve months the patient was examined at regular intervals, but no objective change in her condition was ever found. The twitchings grew more and more frequent and finally occurred almost every day. In all she has had three more general convulsions during this time.

March 1, 1895. *For the last ten days the patient has been suffering from severe headache*—the first headache, she declares, she has ever had in her life; the headache is general in character, not more severe on either side. There is no nausea, vomiting, or vertigo. Bowels have been regular; the urine is free from albumin. The strength of the right hand has diminished perceptibly, the dynamometer showing only 20 as to 32 found two months before. There is no disturbance of sensation beyond a feeling of numbness, which occasionally precedes or follows a localized seizure. Speech is perfectly free. The deep reflexes are as lively as ever on the right side. Dr. Koller, who had examined the patient every few months, finds *her disks for the first time slightly but distinctly cloudy and swollen.*

15*th*. The same ophthalmoscopic condition reported by Dr. Koller; there is now also some dilatation of the veins. The headache has been controlled by gr. x to gr. xv phenacetin a day. Almost every night twitchings in the right hand. The patient cannot flex the small finger of the right hand any more; no other absolute paralysis.

The diagnosis was made of a recurrence of the growth, probably a glioma, at the old seat of the lesion or of a refilling of the evacuated cyst, the diagnosis being based upon the development of headache, which had never been present before, upon the beginning papillitis, and upon the increasing weakness in the right hand. Early operative interference was strongly urged, and on April 8th, two years and ten months after the first operation, the patient was operated upon by Dr. Gerster at the German Hospital. The old flap was raised and immediately beneath it the gold plate was found as bright and untarnished as three years ago. A perfectly smooth membrane, resembling a synovial membrane, had formed on the inner surface of the scalp from the contact with the gold plate. The latter was raised and removed without the slightest difficulty; the dura beneath was of good color, and bulged but little. An aspirating-needle was introduced in four or five directions without any result. The dura was then opened by a crucial incision and was found to be adherent to the brain-substance beneath. Inspection of the exposed brain revealed the presence of a small maroon-colored mass toward the upper margin of the opening in the skull; the latter was enlarged with the aid of the rongeur, exposing the limits of the new growth on all sides. In excising the neoplasm it was found to extend quite a distance vertically into the substance of the brain, being shaped like a cone, with its base on the surface and its apex buried in the substance of the brain. The conical mass, which was hardly larger than a good-sized almond, was removed in two or three pieces from above down and a ring of the surrounding brain-tissue about half an inch wide (on each side) excised, as it was apparent that we had to deal with an infiltrating neoplasm. The adherent piece of dura was also carefully excised. The hemorrhage, which was not profuse, was readily controlled by compression with gauze. The dura and scalp-wound were closed by sutures and the wound dressed. The gold plate was not reinserted on account of a likelihood of a recurrence of the tumor at a future date.

FIG. 1.



Showing the opening in the skull in Case I.

April 9th. Patient has stood the operation well. The right hand and arm are paralyzed; the patient complains of pain in the paralyzed limb. Headache and some difficulty in speech. No temperature.

10*th.* Some headache. Condition unchanged.

12*th.* The patient is able to flex and raise the hand in the wrist-joint somewhat.

13*th.* She is able to move the third and fourth fingers slightly. The sensibility to the lightest touch is unimpaired in the hand and forearm. The sense of position of the fingers and arm very uncertain.

15*th.* Dressing changed. Three severe general seizures occurred after the change of dressings, all of them beginning in the paralyzed arm.

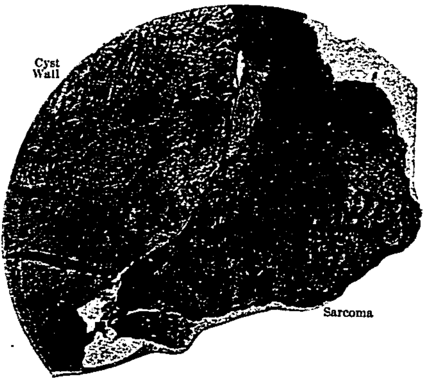
20*th.* The power in the paralyzed muscles is slowly returning; with the exception of the thumb and index-finger the patient can move all of her fingers, with great effort only, to be sure.

May 9th. There is marked improvement in the condition of the arm; the latter can be raised above the head, the patient can shake hands, and has some, though very slight, use of all her joints except those of the thumb and index-finger, which remain paralyzed. The index-finger can be extended and flexed in the metacarpo-phalangeal joint, but not in the two interphalangeal joints. The general condition of the patient is good;

there has been no headache nor any further sign of any convulsive seizure thus far.[1]

The new growth and the surrounding brain-tissue were hardened in alcohol, imbedded in celloidin, and subjected to a careful microscopic examination, which revealed very instructive and interesting morbid conditions. The excised cone was cut in transverse sections and was found to consist in the main of the wall of the old cyst; sections from its apex simply show the very thick cyst-wall consisting of striated fibrous tissue with occasional spindle-shaped cellular elements, the microscopic picture greatly resembling that of the dura mater. A recent hemorrhage in the cyst can be readily demonstrated. As the sections approach the base of the cone—*i. e.*, the surface of the brain—a point is reached at which a sarcomatous growth consisting mainly of spindle-cells can be seen originating from a point of the old cyst-wall (Fig. 2); the remaining cyst-wall

FIG. 2.



Photomicrograph × 25, showing the sarcoma originating from the old cyst-wall.

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[1] A few words concerning the subsequent history of K. H. (Case I.) may be of interest. The patient has been in perfect general health ever since the last operation (one year ago), and shows thus far no symptoms of any further growth of the neoplasm. Since the convulsions which were brought on by the change of dressing after the operation, she has not had the slightest twitching nor sign of any epileptic seizure of any kind, in which respect she is much better off than after the first operation. I attribute the absence of the twitchings to the thorough excision of the affected area, and perhaps, too, to the liberal opening in her skull. The patient has recovered the use of her paralyzed arm to a considerable extent, the thumb and index-finger alone remaining powerless. Cutaneous sensibility is perfect, but there is a marked insufficiency of the muscular sense in the right hand; only comparatively extensive movements in the finger and wrist-joints are appreciated. This dissociated disturbance of the muscular sense in a distinctly cortical lesion affecting the corresponding motor area is of interest. —L. S., March, 1896.

at this level shows recent hemorrhages and two or three areas of small-cell infiltration; otherwise no indication of any active morbid process. In many sections the new growth, not larger than a lentil, can be seen attached to the old cyst-wall with the naked eye. A closer examination of the growth shows it to consist mainly of spindle-shaped sarcoma-elements, partly of glioma-cells and partly of angio-sarcomatous formations.

The microscopic examination of the surrounding brain-tissue was a revelation: at the point where the new growth attached to the cyst-wall was in contact with the brain-tissue, the latter is seen to consist for the extent of a few millimetres of a glio-angio-fibro- and melano-sarcoma, the character of the neoplasm varying at different points. The neoplasm is nowhere sharply separated from the brain-tissue proper; the latter is infiltrated by the elements of the new growth; in some sections two or three islets of spindle-cells, containing not more than a dozen cells apiece, can be seen in the midst of healthy brain-substance, indicating a beginning metastasis.

The malignancy of the entire process is very evident and the recurrence of the growth only a question of time; taking its malignant character and its small extent into consideration, we may conclude, I believe, that its development from the old cyst-wall was of recent date, perhaps not older than a few months, which would agree also with the clinical history.

The conclusions I should like to draw from this case may be formulated as follows:

1. A new growth may be present in the brain without causing any general cerebral symptoms whatsoever. In order to make an early diagnosis of a new growth it is well, therefore, to be guided by the symptoms present rather than by the absence of other customary symptoms.

2. A cystic tumor of the brain not of parasitic origin is not so innocent in character as many would believe.

3. The simple evacuation of such a cyst when found is not sufficient; if it is surgically possible, the wall and the surrounding brain-tissue should be excised in order to prevent a future growth of the malignant elements left in the wall of the cyst.

4. If the immediate excision is not possible, *it would be advisable to open the wound a few months later and attempt to excise the collapsed cyst-wall, which is compressed into a small space by the general cerebral pressure, in the same way in which an abscess-cavity is quickly obliterated after evacuation.* In our case I do not doubt that the secondary excision could have been easily done at any time during the three years which elapsed after the first operation.

CASE II. *Glio-sarcoma of the right cerebellar hemisphere; successful localization; operation; death; autopsy.*—H. S., aged thirty-three years, born in Russia, was first seen on July 31st, at the Mt. Sinai Hospital Dispensary, being referred to my department by the kindness of Dr. Koller, whom he consulted on account of failing vision.

Previous history. The patient has taken liquor moderately; never suffered any injury to his head. Acquired a chancre in 1884; does not know of any secondary manifestations. Has been married six years and has three healthy children.

His present trouble began two years ago with intense headache, vertigo, and occasional vomiting. The giddiness was at times so severe that he would fall to the ground, without losing consciousness, however. About nine or ten months ago he noticed that his eyesight was failing him, and that he was growing deaf in his right ear. His gait was at times so unsteady that he was suspected of being intoxicated. Dr. Koller, whom he consulted, found well-marked choked disks in both eyes and amblyopia of the right eye, so that the patient could distinguish fingers only in the right lower quadrant of the visual field. The vision in the left eye was diminished.

Present condition, July 31st: Tall, well-developed man, of good intelligence. Examination of the head revealed no area especially tender to percussion; the left frontal region was somewhat more sensitive to the blows of the percussion-hammer than other parts of the head. The pupils are dilated and respond sluggishly to light, the right pupil more so than the left. The movements of the right eye are not so perfect as those of the left; the eyeball can be moved in all directions, but extreme positions are not attained, which Dr. Koller ascribes to the loss of vision with its loss of impulse for energetic effort.

The muscles of the face show no paresis whatsoever, the eyes are closed tightly, the eyebrows raised, the cheeks puffed up, the lips puckered, etc., without any noticeable difference between the two sides. The tongue is protruded straight and moved freely. Sensation is not disturbed in the face; the sense of taste is perfectly normal. The right ear is absolutely deaf to air- and bone-conduction. There is no impairment of hearing in the left ear. Pressure of the right hand 76, left 55. There is no muscular weakness nor disturbance of sensation in any part of the body; the sense of position is reliable in all the limbs. The knee-joint is equally lively on both sides; the deep reflexes are easily elicited in both arms. Plantar and cremasteric reflex prompt, abdominal reflex less so. No Romberg. The patient's gait varies: at times he walks without any indication of unsteadiness; at other times there is very marked staggering, the gait resembling that of an intoxicated man, with a tendency to fall to the *right*.

August 2d. The examination was completed by careful electrical tests of the seventh, eighth, and twelfth cerebral nerves.

Examination of the facial nerves shows *partial reaction of degeneration on the right side.*

	Right facial nerve.	Left facial nerve.
Faradic current (coils separated)	120 mm.	120 mm.
Galvanic current	2.5 CaCC.	2.5 CaCC.
Muscles of lower lip:		
Faradic current (coils separated)	80 mm.	100 mm.
Galvanic current	1.5 ma. AnCC. 2.5 ma. CaCC.	3 ma. CaCC.

Contractions sluggish.

We have, therefore, increased galvanic excitability, ACC > CCC, and sluggish contractions in the muscles; no change of excitability in the nerve-trunk; partial reaction of degeneration.

Auditory nerves: In the right (deaf) ear no response at all is obtainable; in the left ear hyperæsthesia (hyper-excitability) with reversal of the normal formula is found:

AnC Sd (sound) at 0.5 ma.
AnC Sd > CaC Sd.
AnC Sd (0.5 ma.) > AnO Sd (1 ma.).

When the positive pole is applied and the current (0.5 ma.) is closed the patient says he hears loud ringing—when the negative pole is applied no sound at all is heard with the same strength of current; when 1 ma. is used loud ringing is heard upon AnC and whistling upon CaC and AnO, though less loud. With 2 ma. the ringing after AnC continues as long as the current is turned on.

N. hypoglossus: The tongue shows no change in the electrical reactions.

Diagnosis. The choked disks, the headache, vertigo, and nausea indicated the presence of a tumor of the brain; the occasional staggering, the spells of intense vertigo, the deafness in the right ear, and the partial R. D. on the right side of the face established the diagnosis of a tumor of the right hemisphere of the cerebellum, compressing the seventh and eighth nerves prior to or at their common entrance at the internal auditory meatus. The exclusive involvement of the seventh and eighth nerves at the base of the brain justified the conclusion that the new growth pressed directly and not indirectly upon them, and that it was situated, therefore, in the ventro-cephalic part of the right cerebellar lobe in the neighborhood of the internal auditory meatus.

As to the character of the tumor, the history of chancre given by the patient had to be taken into consideration, and the possibility of the presence of a gumma could not be excluded. The marked variations in the intensity of the patient's symptoms, of the headache, vertigo, and staggering indicated, however, rather the presence of a vascular growth, a glioma or a sarcoma, and the subsequent complete failure of specific treatment to relieve the condition in any way confirmed this view.

Subsequent course. The patient was put from the very first upon a course of mercurial inunction, 4 grammes a day, and iodide of potash was pushed at the same time rapidly to 200 grains a day.

August 3d. Vision in the right eye entirely lost. The patient was seen walking on the street staggering considerably, with a distinct inclination to fall toward the right side.

8th. The patient was made the subject of a clinical lecture at the New York Polyclinic; the partial reaction of degeneration on the right half of the face and the changed electrical response from the left auditory nerve were easily demonstrated to the students. There was no sign of any weakness in the facial muscles; the patient held a pencil, for instance, tightly between his lips on the right side quite as well as on the left, although the labial muscles showed the R. D. most markedly.

22d. The patient was admitted to the Mt. Sinai Hospital, where he was again subjected to a thorough course of specific treatment without any effect upon the course of the disease at all. Dr. Sachs saw the case with me at the hospital, and agreed with my diagnosis upon my demonstrating to him the changed electrical reactions on the right side of the face.

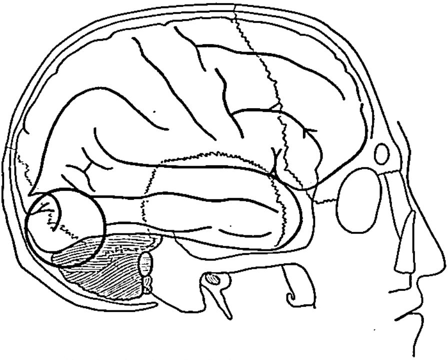
September 10th. The patient's condition is growing slowly worse; the staggering gait is now more constantly present; the headache is intense; the vision of the left eye is diminishing. The patient is as if "dazed," and shows more distinctly the air of absent-mindedness so frequently characteristic of brain-tumor.

17th. There is a slight but distinct paresis of the muscles of the right side of the face; it is most evident when the patient shows his teeth or puffs up his cheeks. The corneal reflex of the right eye is diminished as compared with the left; the cornea can be touched before the reflex occurs. There is no vomiting, but much headache and vertigo.

October 1st. The facial paresis is more marked. Tactile sensibility less acute on the right side of the face than on the left. The patient has some difficulty in swallowing.

The sensory symptoms indicate pressure upon the trigeminal nerve; the difficulty in swallowing shows pressure upon the glosso-pharyngeal nerve.

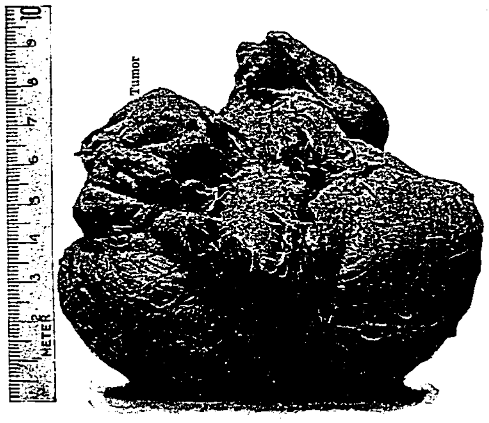
FIG. 3.



Showing site of opening in the skull made in Case II.

The patient's condition was so miserable that it was agreed to make an effort to relieve him by surgical means. After a number of experiments on the cadaver, which demonstrated the possibility of reaching the anterior portion of the base of the cerebellum from above by way of the tentorium, Dr. Gerster proposed entering the skull at the point indicated in Fig. 3, to raise the occipital lobe, if possible, sufficiently to enter the posterior cranial fossa by an opening through the tentorium and to excise and remove the tumor, if it could be reached; otherwise at least to relieve the intracranial pressure by a liberal opening in the skull. The patient was so miserable that he willingly consented to any effort to relieve his sufferings. On October 27th the operation was performed, no change of any consequence occurring meanwhile in the patient's condition. With the gouge, mallet, and rongeur a large opening, three and a half by two and a half inches, was made in the skull backward and partly upward of the mastoid process; the bone was carefully removed from the lateral sinus with the end of the rongeur. The dura was of healthy color and bulged forth immediately very strongly from the cranial opening; its resistance to the pressure of a finger was like that of a board. As soon as the dura was opened by a crucial incision the brain-substance protruded and could not be held back. Dr. Gerster succeeded in raising the occipital lobe sufficiently to see the tentorium, which was seen and felt to be under great pressure from below. An incision was made in the tentorium to relieve the pressure in the posterior fossa, but it was not possible to complete the operation on account of the tremendous intracranial pressure, which rendered it impossible to raise the occipital lobe sufficiently to allow any further manipulating within the skull. The large hernia cerebri had to be ablated; the wound was packed and dressed. The hemorrhage during the entire operation was easily controlled.

FIG. 4.



Photograph of cerebellar tumor.

The patient rallied well from the operation and complained less of headache the next few days.[1] His temperature was normal. During a change of dressings, however, the wound was infected and meningitis developed, the temperature ranging between 100.5° and 104°; the patient became comatose and died November 10th, two weeks after the operation, the temperature rising to 107° just before death.

Autopsy, November 10th, ten hours after death, by Dr. F. S. Mandelbaum, Pathologist to the Mt. Sinai Hospital. Corpse emaciated; considerable rigor mortis. The surgical dressing was removed and the brain-substance beneath lying in the opening of the skull found covered with thick yellow pus. Opening in the skull three and one-half by two and one-half inches by measurement. General purulent pachymeningitis. Upon opening the posterior fossa the right cerebellar hemisphere bulges very strongly; the pial veins of the cerebellum, medulla, and pons engorged. Upon raising the brain a tumor of the size of a small apricot, involving the anterior half of the right cerebellar hemisphere, is found in the very position in which the symptoms during life had pointed. The tumor measures 4.5 x 4.0 x 4.0 cm.; it is not encapsulated, but it is distinctly separated from the surrounding cerebellar tissue in such a way that it could evidently be readily enucleated. The right half of the pons is considerably indented by the new growth; the right seventh and eighth nerves are flattened and thinner than the corresponding nerves on the left side; adhesions between the tumor and the dura were found in the neighborhood of the internal auditory meatus. The lateral ventricles are dilated; the whole brain is very succulent. The microscopic examinations (by Dr. Mandelbaum) showed the new growth to be a glio-sarcoma, in which the sarcomatous elements predominate. Sections from the facial nerve showed advanced degeneration of the myelin-sheaths, the axis-cylinders being but partially destroyed.

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[1] The bedside history of the case, covering the time after the operation up to death, has been mislaid in the hospital, unfortunately, and the data given are based upon my recollection of the case.

The points of interest in this case may be summed up as follows:

1. The occurrence of R. D. in the right facial nerve preceding the development of the first signs of paresis by almost two months, making an early diagnosis of the exact seat of the tumor possible. I have been able to find no other case of the kind in literature in which changed electrical reactions in any of the cerebral nerves were found preceding the onset of paralysis.

2. The hyperæsthesia (increased excitability) and the reversal of the normal formula for the electrical responses from the left auditory nerve, which I am inclined to ascribe to the greatly increased pressure in the posterior fossa. It is difficult to say whether the changed reactions are due to the effect of pressure upon the auditory nerve itself or upon the lymphatic conduit connecting the labyrinth with the posterior fossa. In the latter case the changed reactions would indicate a condition resembling that of the choked disk (*Stauungs-papille*), a condition of lymphatic stasis in the labyrinth (*Stauungs-labyrinth*). Under all circumstances I believe it will be worth our while to examine the auditory nerves in cases of brain-tumor, especially in those in which a tumor in the posterior fossa is suspected; the presence of changed electrical reactions in one or both of the auditory nerves I would consider a valuable aid in the diagnosis.[1]

As to the operation performed, the tremendous intracranial pressure rendered all manipulations within the skull futile. If it were to be attempted over again, I should recommend preliminary tapping of the lumbar region according to Quincke's method, in order to relieve the intracranial pressure to some degree; in the second place, it might be well to open the skull and dura in separate sittings, tapping the lateral ventricles before opening the dura. By taking these measures we might hope that the method, which is possible on the cadaver, would be more successful than it was in our case. The location of the tumor, I should like to add, in the ventro-cephalad part of the cerebellar hemisphere seems to be favored by new growths; Oppenheim,[1] Starr,[2] and Wollenberg[3] have observed cerebellar tumors at the very same point.

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[1] It must be remembered that these tests require a certain amount of intelligence on the part of the patient, for we must rely upon his power of perception of sounds.

REMARKS BY DR. GERSTER.

The problem to be solved in the instance recorded in this history being the removal of a tumor probably located on the ventral surface of the cerebellum, a preliminary study of the topographical relations was made on the cadaver. The cerebellum can be approached and exposed by two routes. The one hitherto employed was a direct exposure of the cerebellum through the cranium composing the posterior cranial fossa. In tumors on or near the posterior aspect of the cerebellum this approach is the best, though the vicinity of the great foramen below, and of the transverse sinus above, serves to limit the size of the aperture. These limits and the dissection of the attachments of the posterior cervical muscles render the field of the operation deep and narrow, and the surgeon's manipulations will necessarily be cramped by the depth of the wound as well as by lack of space, especially when the tumor be large and deep-seated.

It was thought that if the cranium were opened by a generous fenestrum cut out just above the transverse sinus, exposing the upper surface of the tentorium, a tumor situated near or on its ventral surface could be attacked more easily. On the cadavers at my disposal, this route was found to be very feasible, and the occipital lobe being raised from the tentorium ready access was gained to any portion of the cerebellum.

Accordingly, I decided to attempt the removal of the tumor by the route just described.

The exposure of the transverse sinus from above was found very easy, the landmarks guiding the surgeon being unmistakable. The external occipital protuberance and the semicircular line corresponding to the transverse sinus, the craniotomic aperture should be laid just above this ridge. As soon as the occipital lobe was exposed, the opening could be safely enlarged down to the very edge of the sinus. But here we encountered an element of danger and difficulty not met with on the cadaver, and that was the enormous intracranial pressure.

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[1] Oppenheim: Nervenkrankheiten, p. 541.

[2] Starr: Brain Surgery, p. 241.

[3] Wollenberg: Arch. für Psych., xxi. p. 791.

The cerebrum was readily raised from the tentorium and was held up with a broad spatula, and the tentorium was opened by means of a large crucial incision, through which the cerebellar tissue at once bulged out and protruded, so as to render further steps risky and uncertain. It would have been necessary to remove a considerable portion of the cerebellum itself before an extirpation of the growth could have been even attempted. This and the considerable hemorrhage issuing from the much-distended vessels—mostly capillaries—of cerebellum, tentorium, and occipital lobe, finally and principally the crowding forward of the cerebellum filling up the narrow space of the wound, induced me to give up the attempt, which, though ending in removal of the growth, might also cause death on the operating-table.

The wound was drained by a large tampon of iodoform-gauze, which was brought out through the external wound, and the usual dressings were applied.

Subsequently we ascertained that the size of the tumor was so great that it would have been utterly impossible to remove it safely even through the largest possible craniotomy wound.

Though the plan pursued in this case was not successful, it may be stated, nevertheless, that the route here outlined is feasible, and cannot but be useful and successful in cases in which the tumor occupies the central parts of the cerebellum or the tentorial surface, and where its size does not preclude every possibility of safe operating.

CASE III. *Spindle-cell sarcoma of the left arm, face, and speech centres; successful localization; operation; death; autopsy.*—H. B., aged fifty years, peddler, native of Russia, was first seen March 17, 1894, at the Mt. Sinai Hospital Dispensary. The patient claimed to have been well till five months previously (October, 1893), when he was suddenly taken with the first spell of the character about to be described.

The patient has been married twenty-four years; he denies specific infection; does not remember having ever suffered any injury to his head. His wife states that she has borne him ten children, of which four were stillborn, two died when three and eight months old; four are living and well; the stillborn children were covered with an eruption and were born prematurely; all of the living children were covered with a rash at birth or developed one soon after. Mrs. B. aborted five times besides. A careful examination of the patient himself revealed no traces of syphilis. The youngest daughter has Hutchinson teeth. The examination of the patient's wife showed the presence of Argyll-Robertson pupils, with myosis and inequality of the two pupils, and the absence of both knee-jerks—in other words, she is suffering from locomotor ataxia, although she is entirely unaware of her condition. These points are emphasized because they bear strong evidence of a specific taint in the patient's family, and therefore presumably in the patient himself in spite of his assurance to the contrary.

In October, 1893, while enjoying perfect health, the patient was suddenly taken with a seizure in which his head and mouth were drawn violently to the right; the right arm jerked somewhat, the leg not at all. The jerking lasted about five minutes, the patient remaining perfectly conscious. There was neither headache nor drowsiness after the spell. In all the patient has had up to date eight similar attacks, the last of which I witnessed at the dispensary the very first day I saw him. The seizure began with clonic contractions in the muscles of the right half of the face, and the head was drawn to the right side; after a few moments the right arm and leg began jerking, mainly in the shoulder- and hip-joints. The seizure lasted about four minutes, the patient retaining consciousness throughout. After the spell he seemed dazed and was not able to speak for a few minutes. He then gave a lucid history of himself without any hesitancy or difficulty of speech. He suffers occasionally from headache, which is not very severe; does not complain of vertigo, nausea, or vomiting. Examination shows flattening of the right half of the face as compared with the left. The electrical reactions normal; no other disturbance of any significance can be made out. Bearing in mind the family history and on general principles, mercurial inunctions, 3 grains a day, were ordered and an iodide-bromide mixture prescribed. The patient was seen two or three times at the dispensary, and then passed out of my view for six weeks. On May 18th he returned and reported that six weeks ago he had been suddenly taken very ill, losing the power of speech and suffering intensely from headache. According to the statement of his wife, the aphasia did not develop after an epileptic seizure. The patient was semi-conscious for three days, during which time he could not speak at all. The aphasia then gradually improved, the patient brightening up at the same time. A marked degree of aphasia remains, however, and the intelligent patient tells me he frequently wishes to say something but cannot find the words for it. His speech is hesitating and slower than before the outset of aphasia. The patient is more drowsy, falls asleep in his chair at table; he has grown phlegmatic and indifferent to his family and surroundings. His headache has been intense and constant; he is not able to locate it in any special part of the head. There is no nausea, vertigo, or vomiting.

Examination (May 18th) shows marked palsy of the muscles supplied by the two lower branches of the right facial nerve, the patient himself remarking that he must remove with his fingers food which is caught between his gums and cheek on the right side. The electrical reactions are unchanged. The right hand and arm are distinctly weaker than the left (dynamometer-test: R. 25; L. 40); the legs show no difference in strength. The right knee-jerk is exaggerated as compared with the left. The pupils respond promptly to light and accommodation. The ophthalmoscopic examination made by Dr. Koller shows absence of any indication of choked disk. When the entire head is tapped lightly with a percussion-hammer *the patient points to the region of the left lower motor area as being most sensitive to the blows.* The urine is free from albumin and sugar; there is no blue-line on the gums.

Diagnosis. The diagnosis was made of a tumor of the brain involving the face and probably the arm- and speech-centres in the lower half of the left central convolutions; on account of the involvement of speech, rather forward than backward of the fissure of Rolando.

The differential diagnosis was made between specific meningitis, brain-abscess, general paresis, and a vascular lesion (thrombosis), plumbism and uræmia being out of the question. A vascular lesion could be readily excluded by the slow development of symptoms, the signs of cortical irritation preceding any loss of power by four or five months at least, and by the presence of the tender point on the skull. General paresis occasionally begins with focal epileptic seizures, but there was in our case an absolute absence of any somatic or mental symptom of general paresis, nor does a tender point on the head occur in uncomplicated paresis. The absence of any purulent focus in the body of the patient and of any traumatic history militated against the presence of an abscess; nor were there any variations of temperature to indicate an abscess in preference to a tumor. In view of the specific history syphilis of the brain, more especially specific meningo-encephalitis of the convexity, had to be carefully considered. Three very important points could be urged against its presence:

1. In syphilis of the brain, especially of the meninges, severe headache is an *early*, often predominating, symptom; in our case the patient did not suffer from headache of any consequence till partial paralysis had developed, nor was his headache at any time more severe at night, as is often the case in specific disease.

2. The course of syphilitic brain-disease is subject to great variations in the intensity of the symptoms; sometimes from day to day, or week to week, symptoms come and go and do not show the steady development observed in the case under question.

3. Specific meningo-encephalitis yields readily to energetic specific treatment, especially when applied early—our patient grew steadily worse under a thorough course of specific treatment. Nor were there any other signs of syphilis of the nervous system, as is so often the case, present to support the diagnosis of syphilis.

The diagnosis of tumor was based upon the following facts:

1. The slow and steady development beginning with symptoms of cortical irritation (focal epilepsy), followed subsequently by a gradually increasing paralysis of the very group of muscles originally the seat of convulsive jerking, which indicates a progressively destructive morbid process.

2. The simultaneous increase of general cerebral symptoms, notably of the headache and slow cerebration, with the further development of the focal symptoms.

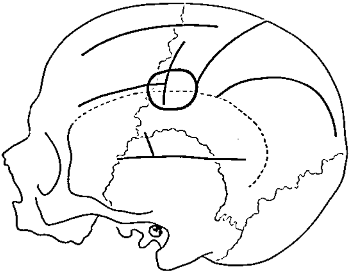
3 The presence of a circumscribed tender point of the skull corresponding to the part of the brain to which the focal symptoms pointed.

4. The exclusion of other forms of organic brain-disease.

The successive involvement of the motor centres (face, arm, and speech), the focal epileptic discharges and the presence of the tender point, indicated that the tumor was superficial, probably cortical, and not in the centrum ovale.

The patient was sent in to the Mt. Sinai Hospital, service of Dr. Howard Lilienthal, with the above diagnosis, and the request to subject him for ten days longer to specific treatment; if no change for the better occurred, to operate and remove the new growth. For reasons beyond my control, which need not be stated here, the proposed operation was put off again and again, and the unfortunate patient rubbed with enough mercury to cure him over and over again of syphilis. During this time the man's hebetude and stupor increased steadily; he would sit for hours without uttering a word; it required urging to induce him to talk at all; frequently he would not be able to call a given object by its right name, but would nod approvingly if the name was told him. Finally he hardly said a word at all any more, which was partly ascribed to his stupor. In May he was still able to write with Hebrew characters. He understood and obeyed simple orders, but did everything slowly, with that peculiar air of absent-mindedness characteristic of the presence of a tumor. He was emotional and cried easily. The facial palsy became almost complete; the right arm was practically paralyzed; the patient dragged his right leg in walking. The knee-jerk was greatly increased and ankle-clonus developed on the right side. He complained, if he said anything at all, constantly of headache. If his head was tapped lightly with the percussion-hammer, he would now point to either side of his head, when asked where it hurt him; if his face was watched, however, *it was seen that he would screw up his face with an exquisite expression of pain, and that he would draw his head away from the hammer whenever a given point was tapped ever so lightly.* It was the same point he had formerly pointed out himself No sign of papillitis developed till the end of July, when Dr. May reported a dilatation of the veins of the retina and a slight cloudiness of the left disk.

FIG 5.

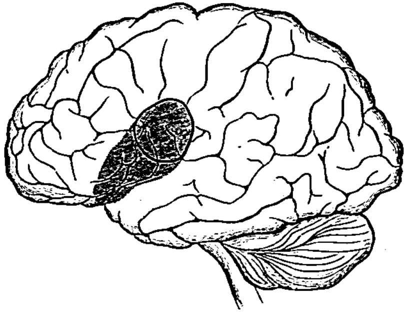


Showing the opening in the skull in Case III.

Finally, on July 25th, the patient, who had fallen away considerably, was operated upon by Dr. Lilienthal. The head was shaved the day before the operation. Immediately before the operation I determined with Wilson's cyrtometer the location of the face- and arm-centres, which I selected on account of the complete paralysis of those parts. Dr. Lilienthal marked the centre of the area determined with a small preliminary cross-incision in the scalp. I then remarked it would be well to compare the area determined with the painful point, stating that, if they did not correspond, I would prefer Dr. Lilienthal entering the skull at the seat of cranial tenderness, which I considered a diagnostic point of supreme importance. I then began tapping the patient's head, and to our surprise he showed no sign of pain. Involuntarily I had avoided the immediate vicinity of the small incision in the scalp, as it was bleeding somewhat; I now tapped at this point, and, to our gratification, the patient immediately drew his head away and screwed up his face as he had always done when examined before.

After raising a liberally sized flap which bled profusely, Dr. Lilienthal opened the skull with the hammer and chisel at the point agreed upon (Fig. 5). Everything bled, the flap, the diploe, and two branches of the middle meningeal artery, and the hemorrhage was stopped with great difficulty. The exposed dura did not bulge or pulsate, nor was it discolored. An aspirating-needle was introduced in every direction, but no resistance was felt; in perforating the dura with the needle it felt tough and thickened. The exposed area was soft to the touch, at the anterior superior edge of our opening there seemed to be somewhat more resistance. The patient had lost so much blood and his condition was so bad that we decided to open the dura at a subsequent sitting, if the patient survived the present operation. Unfortunately, in spite of transfusion being made, the patient never regained consciousness and died twenty-nine hours after the operation, the temperature rising above 106° F. immediately before death.

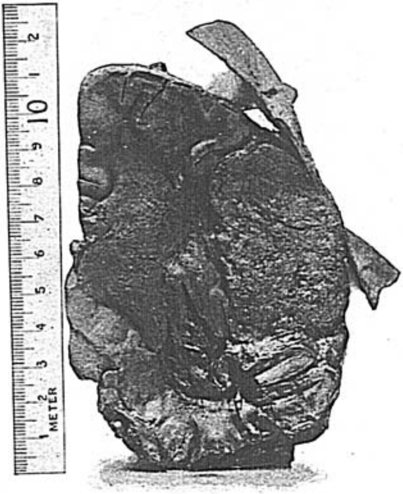
FIG. 6.



Showing the site of the tumor on the surface of the brain in Case III., and the part beneath the cranial opening.

The *autopsy* was made two hours after death by Dr. Yankauer: The cranial wound was sweet and aseptic; no further hemorrhage had occurred. A small ring of clotted blood was adherent to the dura along the margin of the opening in the bone. The skull-cap was raised and the brain removed *in toto*. On the left side of the brain, at the point corresponding to the opening in the skull, as indicated by the ring of clotted blood, the dura was adherent to the substance beneath and was slightly discolored. There was nowhere any sign of meningitis. The convolutions of the left hemisphere were flattened. In the left motor region a large tumor involving the lower half of the ascending frontal convolution, the operculum, the base of the second and third frontal convolutions, and the tip of the temporo-sphenoidal lobe was found; posteriorly the tumor is bounded by the furrow of Rolando, which is crossed at no point. The centres involved are the arm, face, tongue, and motor speech-centres; the last is entirely destroyed. The tumor is softer to the touch than the surrounding brain-substance, is of the color of the latter, only mottled and of a dirtier tinge. No distinct capsule is present, but the growth is sharply separated from the brain-substance, and was partly enucleated after hardening very readily (Fig. 8). The tumor is 7 cm. long from above down and somewhat forward, 4.5 cm. broad at its broadest point, and 4 cm. deep. The dura is adherent to the upper half of the tumor, the part involving the face- and arm-centres. The adherent area corresponds to the opening made in the skull and at the same time to the upper, anterior, and posterior limits of the tumor; the latter extends downward below the lower margin of our opening 3 cm. to 4 cm., so that we would have been obliged to enlarge the opening considerably if the removal of the entire new growth had been attempted.

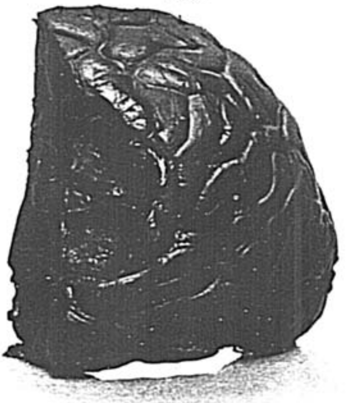
FIG. 7.



Photograph of part of tumor in Case III., showing the adherent dura.

The microscopic examination shows the tumor to be a spindle-cell sarcoma throughout; numerous sections made through the part to which the dura was adherent show the dura and the pia thoroughly infiltrated with sarcomatous elements, but the new growth very evidently did not originate in the coverings of the brain. The clinical course of the disease bears strong evidence, however, that the disease began in the face-centre and subsequently invaded the speech- and arm-centres.

FIG. 8.



Side view after enucleation of the tumor.

The case is instructive, I believe, in several respects. *In the first place,* it demonstrates the important fact *that optic neuritis may be absent in the presence of a large brain-tumor,* a fact demonstrated also by cases of Gowers[1] and Pel;[2] if such is the case, the absence of choked disk does not justify the postponement of an operation when the symptoms of a focal lesion are sufficiently clear and the diagnosis of a new growth otherwise well founded. *In the second place,* the case demonstrates the fact that a previous history of syphilis does not preclude the presence of a non-specific growth; in Case II. a history of syphilis was also obtained and a glio-sarcoma found at the autopsy. This raises the important question, How long should these cases be subjected to specific treatment before operation is performed? Horsley says six weeks, Starr[3] favors three months. My own experience with cases of syphilis of the brain[4] giving symptoms of focal organic disease has been that they respond with few exceptions remarkably quickly to energetic specific treatment consisting of inunctions of 3 to 5 grammes of blue ointment and iodide of potassium or sodium in doses of 300 to 400 drops of the saturated solution a day. The rapid improvement in the condition of these patients is often astounding; in one case which I have in mind the symptoms resembled those in the case in question in many respects, intense headache, aphasia, paresis of the facial muscles and right arm, and choked disks being present; the patient was found in profound coma the second day I saw him with a pulse as low as 40 (heart-beat counted and 10 respirations to the minute); inunctions were commenced the same day and the iodides added as soon as the patient was able to swallow them; within a week the headache was gone and the aphasia and hemiparesis were greatly improved; within three weeks the patient was able to return South with but few traces of the disease left. Other cases of the kind might be mentioned, but no doubt many of the gentlemen present have had similar experiences. I should like to urge, therefore, that if no improvement in the symptoms, especially in the headache, is obtained within three weeks, none is likely to occur, providing the specific treatment is energetic and the patient is not cachectic at the time the treatment is commenced. Prolonged mercurial treatment in non-specific cases is apt to influence the general condition unfavorably and to weaken the patient's powers of resistance to the shock of subsequent surgical interference. In our case the patient should have been operated upon in May, as soon as the diagnosis of a new growth had been made with certainty and thorough specific treatment had failed to stay the course of the disease.

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[1] Gowers: Diseases of the Nervous System, vol. ii. p. 505.

[2] Pel: Berliner klinische Wochenschrift, June 29, 1894.

[3] Starr: Brain Surgery, p. 206.

[4] See article "Syphilis of the Brain." New York Medical Journal, July 13, 1895, p. 33.

The absence of headache for the first five or six months, and of nausea, vomiting, and vertigo throughout is another point of interest in the case. This simply supports the view expressed in connection with Case I., that symptoms present are of greater value in arriving at a diagnosis than the absence of other symptoms, which might be looked for.

The inefficiency of probing for a tumor with an aspirating-needle could not be demonstrated more conclusively than shown by this case—although the tumor was immediately beneath our opening, the needle gave absolutely no information as to its presence. The greater resistance to the touch felt at the anterior superior margin of our opening was offered by the normal brain-substance, which was harder than the tumor.

In conclusion, the three cases reported show, I believe, the truth of the statement that brain-surgery in order to be successful requires an early diagnosis and early operation. The best result was obtained in Case I., because it was operated upon as soon as the diagnosis of an organic lesion was assured and specific treatment had failed.

REMARKS BY DR. LILIENTHAL.

It is my belief that if we are ever to have success in this field of surgery, operation must be undertaken early. Where a cortical lesion can be accurately localized, to wait for general symptoms such as may be expected to arise from pressure, or to wait for the systemic poisoning known as cachexia, is to lose the possibility of anything more than palliation. As in gastric cancer it is usually too late for a curative operation when a tumor is palpable, so in circumscribed cortical lesions of a non-syphilitic nature choked disk and vomiting indicate the existence of something which might better have been attacked before the supervention of these symptoms. I do not deny the value and even the necessity of tentative antisyphilitic medication, but I believe that where no direct history points to syphilis as a cause of the trouble, weeks, not months, might better measure the time of trial.

The death of this particular patient can, I believe, be ascribed almost entirely to the furious bleeding from enormous newly formed vessels in the diploë. The actual amount of blood lost was not greater than I have frequently seen in operations on persons of the general physique of this man, but his condition was poor and his powers of resistance lower by far than I had estimated. The hemorrhage was controlled as well as possible by gauze-compression over the cut surface of the bone, but at every fresh bite of the rongeur the flow from the same vessels again divided was so severe that before the time came to open the dura the pulse had flagged to such an extent that the operation had to be suspended. It was my intention to open the dura in a day or two, thus making the operation in two stages, but the death of the patient from acute anæmia, in spite of repeated intravenous saline infusion, put an end to everything. It would in such cases be better to operate in two or three or even more stages. By great care the slightly increased danger of sepsis could, I believe, be overcome, and even with sepsis there is a better chance of ultimate success than with dangerous hemorrhage. Since my sad experience with this patient, I have in other cranial cases employed a wax recommended by Dr. R. H. Cunningham, of this city, and I am so pleased with the prompt and easy manner in which it can be used to check bleeding, that I shall be unwilling to undertake another operation on the skull without having a supply at hand. This wax is made by boiling in a test-tube sheets of soft white wax, such as is used in the manufacture of artificial flowers. It turns slightly brown in the boiling. A little castor oil—about one drop to the gramme—is added to this liquid wax and the whole is allowed to cool. The upper part of the test-tube is then heated to sterilize it thoroughly, and is cotton-plugged. These tubes of wax will keep indefinitely. When it is desired to make use of it, a glass rod is to be heated and melted into the solid wax after removing the cotton plug. When the rod is firmly *set* in the wax, its end projecting some inches from the open end of the test-tube, hold the test-tube in the flame, using the rod as a handle. Thoroughly heat the tube, beginning at its mouth and slowly revolving it on its long axis. When the wax is reached quickly heat this part of the tube and pull the thimble of wax out by means of the rod. This wax may now be put into sterile hot salt-water, and should be kneaded until it is of the right consistency. At each bite of the forceps a little wax is to be pressed with the finger into the bleeding bone. The wax is aseptic and may be left in place.

SYPHILIS AND THE ETIOLOGY OF ATHEROMA.

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In this paper I purpose shortly to consider the nature of arterial atheroma, more especially with regard to the part, if any, played by syphilis in its causation. Everyone is familiar with the appearance of atheroma in the aorta, the formation of thickened patches, the fibrous, pulpy, or calcareous formations in its inner coat. It is not my intention to describe these changes, which have already so often been described both macroscopically and microscopically, but to discuss certain questions in their etiology.

The importance of the part played by syphilis in the causation of aneurisms[1] must certainly be acknowledged, and hence some would argue that syphilis exerts a like influence in the production of arterial atheroma, but the latter conclusion is not a fair one. In order to show that such a conclusion is not justified it becomes necessary to make a digression and to discuss shortly the *rôle* of syphilis in the causation of aneurisms.

For this purpose it will be best to confine ourselves to aneurisms of the aorta, so as to exclude, as far as possible, aneurisms due to traumatism, bruising, and embolism, and especially to exclude those caused by septic inflammation of the arterial walls, set up by emboli in cases of infective endocarditis.[2] Aortic aneurism occurs chiefly at the middle period of life; out of ninety-two cases analyzed by Dr. Thomas Hayden, sixty occurred between the ages of thirty and fifty,[3] whereas the same author found that atheroma was most common after the age of sixty. In spite of this, however, Dr. Hayden evidently considered aneurism to be due to atheroma, or at least to antecedent changes in the vessel-walls,

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[1] The statistics on this subject are, of course, as liable to error and as hard to ascertain correctly as those of antecedent syphilis in cases of tabes dorsalis. Professor Clifford Allbutt tells me he would say that in 90, or even 95, per cent. of aneurisms there has been previous syphilis. See also F. H. Welch, "On Aortic Aneurism in the Army." Med.-Chir. Trans., 1876, vol. lix.

[2] See J. Langton and W. Bowlby, "Multiple Embolism of the Arteries of the Extremities." Med.-Chir. Trans., 1887, vol lxx.

[3] See "Diseases of the Aorta," in Quain's Dictionary of Medicine, first and second editions. Other statistics agree in pointing to the period between the ages of forty and fifty as the commonest for aortic aneurism.